HIGH PRODUCTION VOLUME (HPV)

CHEMICAL CHALLENGE PROGRAM

201-14361A

TEST PLAN

For

2,3,4,5,6-PENTACHLOROPYRIDINE

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PLAIN ENGLISH SUMMARY

This test plan addresses 2,3,4,5,6-pentachloropyridine (CAS No. 2176-62-7). Existing data are summarized. Additional data will be collected under test plans under the HPV Challenge Program.

EXECUTIVE SUMMARY

The Dow Chemical Company hereby submits for review and public comment the test plan for 2,3,4,5,6-pentachloropyridine under the Environmental Protection Agency's (EPA) High Production Volume (HPV) Chemical Challenge Program. It is the intent of The Dow Chemical Company to use new information in conjunction with a variety of existing data and scientific judgment/analyses to adequately characterize the SIDS (Screening Information Data Set) human health, environmental fate and effects, and physicochemical endpoints for this chemical.

Predictive computer models will be used to develop much of the environmental fate data for the chemical. The calculated data will be developed from a computer model used by the EPA. Physicochemical properties will be included.

TABLE OF CONTENTS
TEST PLAN FOR 2,3,4,5,6-PENTACHLOROPYRIDINE

PAGE

TEST PLAN FOR 2,3,4,5,6-PENTACHLOROPYRIDINE

I. INTRODUCTION

The Dow Chemical Company has committed voluntarily to develop screening level human health effects, environmental effects and fate, and physicochemical test data for 2,3,4,5,6-pentachloropyridine under the Environmental Protection Agency's (EPA's) High Production Volume (HPV) Challenge Program (Program).

This plan identifies the chemical and its CAS number, identifies existing data of adequate quality for the chemical, and outlines testing planned to develop screening level data for the chemical under the Program. The objective of this effort is to identify and develop sufficient test data and/or other information to adequately characterize the human health and environmental fate for the chemical in compliance with the EPA HPV Program. Physicochemical data that are requested in this program will be provided.

II. DESCRIPTION OF 2,3,4,5,6-PENTACHLOROPYRIDINE

A. The Chemical

2,3,4,5,6-Pentachloropyridine (CAS No. 2176-62-7) is a member of a group of chemicals known as chloropyridines, used in the production of chlorinated pesticides. This material, like other structurally similar materials, has been studied to provide safe handling information.

III. TEST PLAN RATIONALE

A. Classification of the Chemical as a Production Chemical

Requirements

Classification of 2,3,4,5,6-pentachloropyridine is as a production chemical under the EPA HPV program.

B. Human Health Effects

There are six mammalian toxicity endpoints in the HPV Program:

Acute Toxicity
- Repeated Dose Toxicity
- Genetic Toxicity *In Vitro*
- Genetic Toxicity *In Vivo*
- Reproductive Toxicity

Developmental Toxicity

Published and unpublished data, as detailed in the attached Robust Summaries, satisfy the requirements of all required mammalian testing except Developmental Toxicity and Genetic Toxicity *In Vitro* and *In Vivo*. We propose to conduct tests for Developmental Toxicity (teratology study in rats), Genetic Toxicity *In Vitro* (Ames' test) as well as an In Vitro rat lymphocyte cytogenetics assay, as information from the EPA indicates that the combination of the two tests will satisfy requirements under the program. The attached Robust Summaries with the proposed testing provide adequate data to characterize the human health effects endpoints under the Program.

C. Ecotoxicity

There are three aquatic toxicity endpoints in the HPV Program:

- Acute Toxicity to Fish
- Acute Toxicity to Aquatic Invertebrates
- Toxicity to Algae (Growth Inhibition)

EPA identifies the following test methods to determine these endpoints: OECD Guideline 203, *Fish Acute Toxicity Test*; Guideline 202, *Daphnia sp., Acute Immobilization Test*; and Guideline 201, *Alga Growth Inhibition Test* [2] or equivalent studies.

Published and unpublished data, as detailed in the attached Robust Summaries, satisfies requirements for ecotoxicity data except for Toxicity to Algae. We propose to conduct a Toxicity to Algae (Growth Inhibition) study on *Selenastrum capricornutum*.

The existing data, along with the proposed testing, will be adequate to characterize ecotoxicity endpoints under the Program.

D. Environmental Fate

Predictive models were used to develop meaningful data for chemicals that are gaseous at relevant environmental temperatures and pressures. The environmental fate data include:

Photodegradation
- Stability in Water (Hydrolysis)
- Transport and Distribution (Fugacity)

- Biodegradation

1. Photodegradation

Photodegradation was estimated using models accepted by the EPA [4]. An estimation method accepted by the EPA includes the calculation of atmospheric oxidation potential (AOP). Atmospheric oxidation as a result of hydroxyl radical attack is not direct photochemical degradation, but rather indirect degradation. AOPs can be calculated using a computer model. Chemicals that are gases will be available for atmospheric oxidation reactions with photochemically generated hydroxyl radicals. This will be the most significant route of degradation in the environment for category members.

The computer program AOPWIN (atmospheric oxidation program for Microsoft Windows) [1] is used by The Dow Chemical Company. This program calculates a chemical half-life based on an overall OH reaction rate constant, a 12-hr day, and a given OH concentration. This calculation was performed for 2,3,4,5,6-pentachloropyridine , as detailed in the attached Robust Summaries.

2. Stability in Water (Hydrolysis Modeling)

Hydrolysis of an organic chemical is the transformation process in which a water molecule or hydroxide ion reacts to form a new carbon-oxygen bond. Chemicals that have a potential to hydrolyze include alkyl halides, amides, carbamates, carboxylic acid esters and lactones, epoxides, phosphate esters, and sulfonic acid esters [5]. However, halogenated aromatic organics are generally resistant to hydrolysis (Lyman, 1990). Stability in water can be measured [3] (EPA identifies OECD test guideline 111 as a test method) or estimated using models accepted by the EPA [4]. An estimation method accepted by the EPA includes a model that can calculate hydrolysis rate constants for esters, carbamates, epoxides, halomethanes, and selected alkylhalides. The computer program HYDROWIN (aqueous hydrolysis rate program for Microsoft windows) [1] was used for hydrolysis calculation, as detailed in the attached Robust Summaries.

3. Chemical Transport and Distribution In The Environment (Fugacity Modeling)

Fugacity based multimedia modeling can provide basic information on the relative distribution of chemicals between selected environmental compartments (i.e., air, soil, sediment, suspended sediment, water, biota). The US EPA has acknowledged that computer modeling techniques are an appropriate approach to estimating chemical partitioning (fugacity is a calculated endpoint and is not measured). A widely used fugacity model is the EQC (Equilibrium Criterion) model [6]. EPA cites the use of this model in its document titled *Determining the Adequacy of Existing Data* [4], which was prepared as guidance for the HPV Program.

In its document, EPA states that it accepts Level I fugacity data as an estimate of chemical distribution values. The input data required to run a Level I model include basic physicochemical parameters; distribution is calculated as percent partitioned to 6 compartments within a unit world. Level I data are basic partitioning data that allow for comparisons between chemicals and indicate the compartment(s) to which a chemical is likely to partition.

The EQC Level I is a steady state, equilibrium model that utilizes the input of basic chemical properties including molecular weight, vapor pressure, and water solubility to calculate distribution within a standardized regional environment. This model will be used to calculate distribution values for 2,3,4,5,6-pentachloropyridine. A computer model, EPIWIN - version 3.02 [1], will be used to calculate the properties needed to run the Level I EQC model.

4. Biodegradation Testing

Biodegradation is the utilization of a chemical by microorganisms as a source of energy and carbon. The parent chemical is broken down to simpler, smaller chemicals, which are ultimately converted to an inorganic form such as carbon dioxide, nitrate, sulfate, and water. Assessing the biodegradability of organic chemicals using a standard testing guideline can provide useful information for evaluating chemical hazard.

Biodegradation values for 2,3,4,5,6-pentachloropyridine, as detailed in the attached Robust Summaries, were experimentally determined.

E. Physicochemical Properties

The physicochemical properties include:

- Melting Point
- Boiling Point
- Vapor Pressure
- Octanol/Water Partition Coefficient

Data for physicochemical properties will be summarized from various resources and detailed in the attached Robust Summaries.

IV. TEST PLAN SUMMARY

The following testing, modeling, and technical discussions will be developed for 2,3,4,5,6-pentachloropyridine:

- Conduct a teratology probe study and full study in rats
- Conduct an Ames study.

- Conduct an in vitro rat lymphocyte cytogenetics assay.
- Conduct an algal growth inhibition study on Selenastrum capricornutum. Calculate fugacity data.

Summaries of results will be developed once the data and analyses are available. This test plan is expected to provide adequate data to characterize the human health effects and environmental fate and effects endpoints under the Program.

For reasons indicated in the above paragraphs, we do not believe additional data needs to be generated beyond the studies listed. Due to the nature of the chemical; the manner in which the chemical is manufactured, distributed, processed and used, the product stewardship measures taken to prevent exposure; and existing human/environmental data, we believe that our workers, the public and the environment are well protected from exposure to PCP.

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